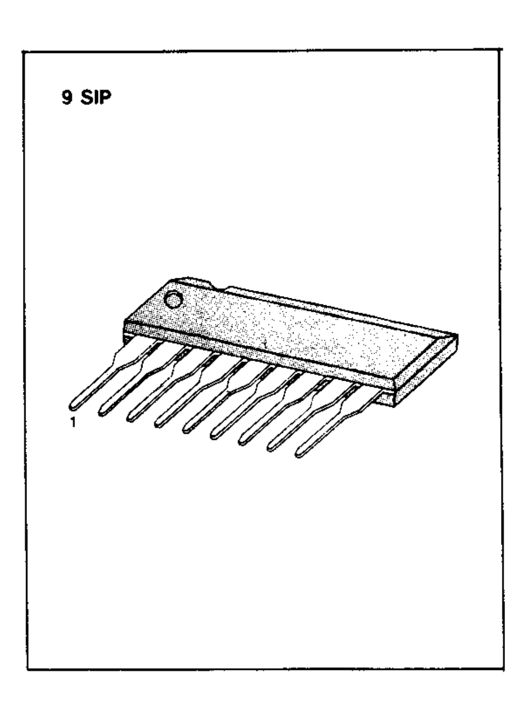
EQUALIZER AMPLIFIER WITH ALC

The KA2220 is a monolithic integrated circuit consisting of a preamplifier and ALC circuit for cassette tape recorders



FEATURES

- **Low noise amplifier.**
- **Wide operating supply voltage range: $V_{CC} = 3.5V \sim 14V$**
- **High output voltage.**
- **Low distortion.**
- **Wide ALC range.**
- **KA2220 ST: Good ALC pair characteristic for stereo tape recorders**

ORDERING INFORMATION

Device	Package	Operating Temperature
KA2220	9 SIP	−20°C ~ +70°C

BLOCK DIAGRAM

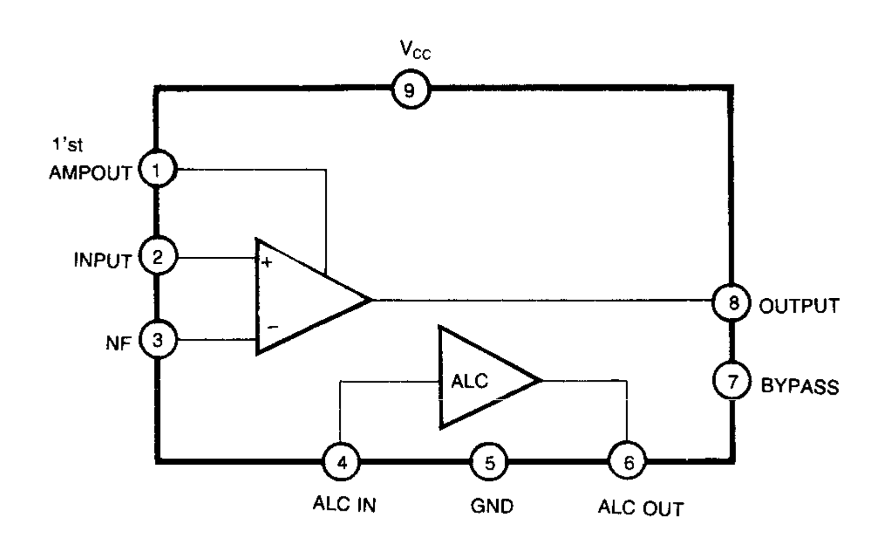


Fig. 1

ABSOLUTE MAXIMUM RATINGS (T_a=25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	15	V
Power Dissipation	P_D	200	mW
Operating Temperature	T_{OPR}	−20 ~ +70	°C
Storage Temperature	T_{STG}	−40 ~ +125	°C

ELECTRICAL CHARACTERISTICS

(Ta=25°C, V_{CC}=5V, R_L=5.1KΩ, R_G=600Ω, f=1KHz, NAB, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Quiescent Circuit Current	I_{CCQ}	V_I=0, ALC OFF		1.4	2.0	mA
Open Loop Voltage Gain	G_{VO}		66	69		dB
Closed Loop Voltage Gain	G_{VC}	V_O=0.7V	33	35	37	dB
Output Voltage	V_O	THD=1%	0.7	1.0		V
Total Harmonic Distortion	THD	V_O=0.2V		0.1		%
Input Resistance	R_I		60	100		KΩ
Equivalent Input Noise Voltage	V_{NI}	R_G=2.2KΩ, NAB BW (−3dB)=15Hz ~ 30KHz		1.0		μV
ALC Transistor Saturation Voltage	V_{SAT}			75	100	mV

TEST CIRCUIT

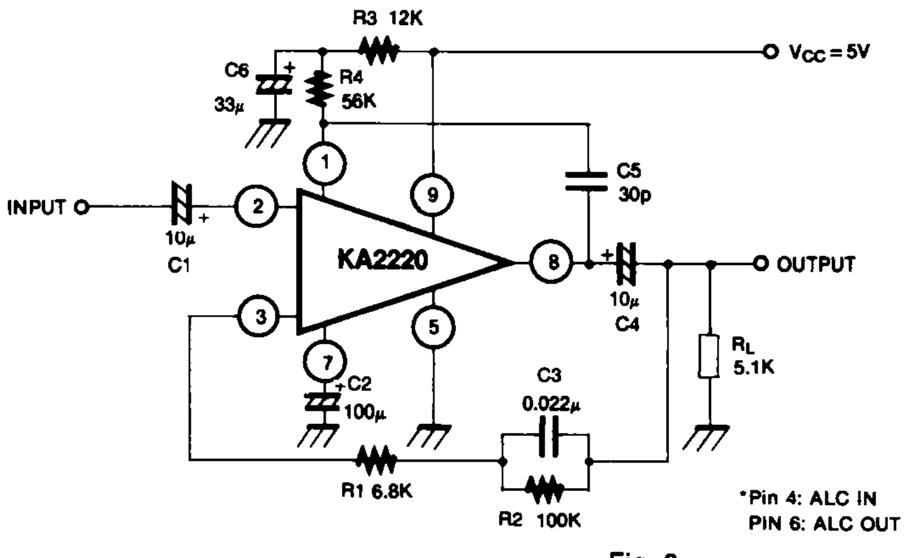
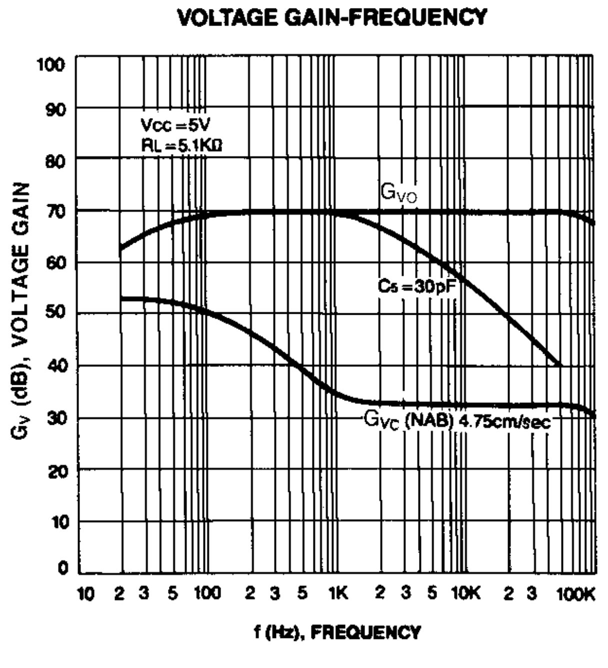
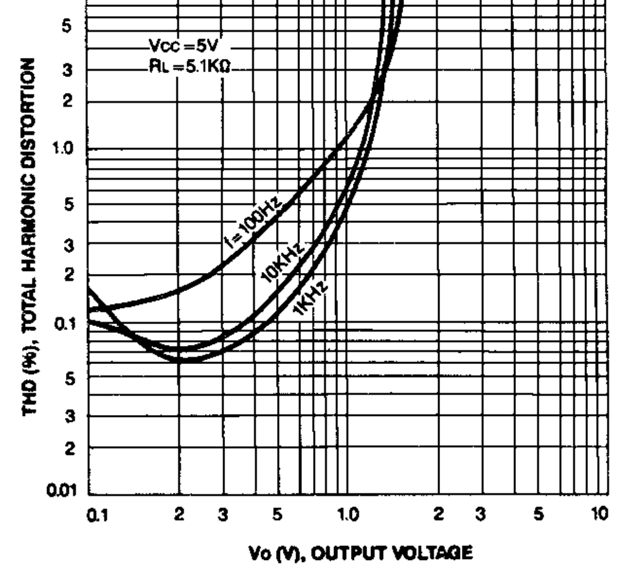
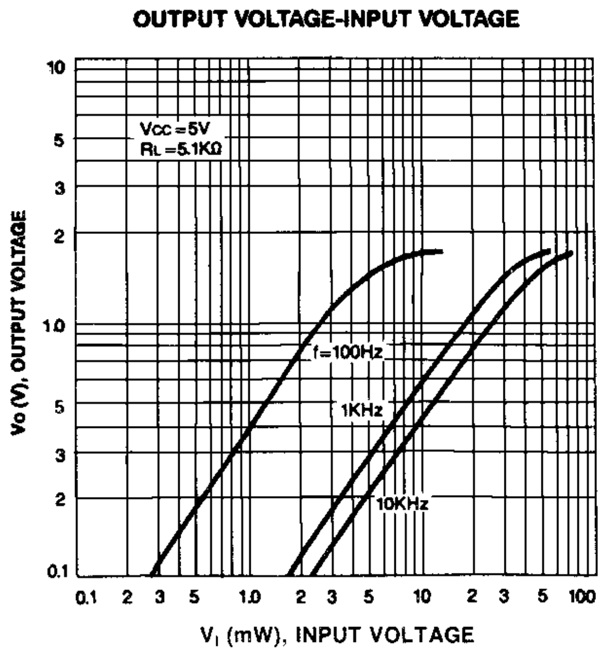
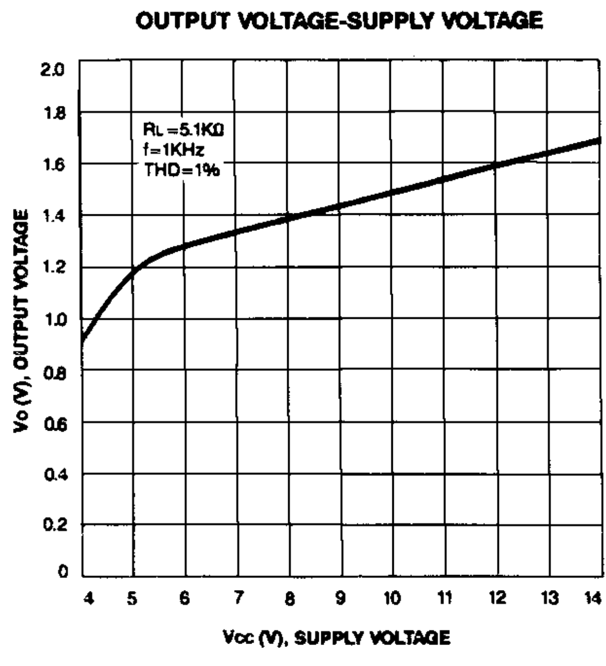


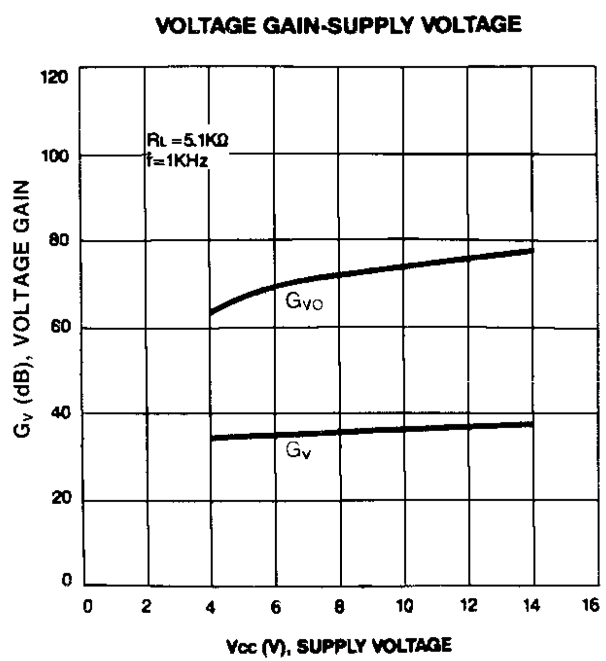
Fig. 2

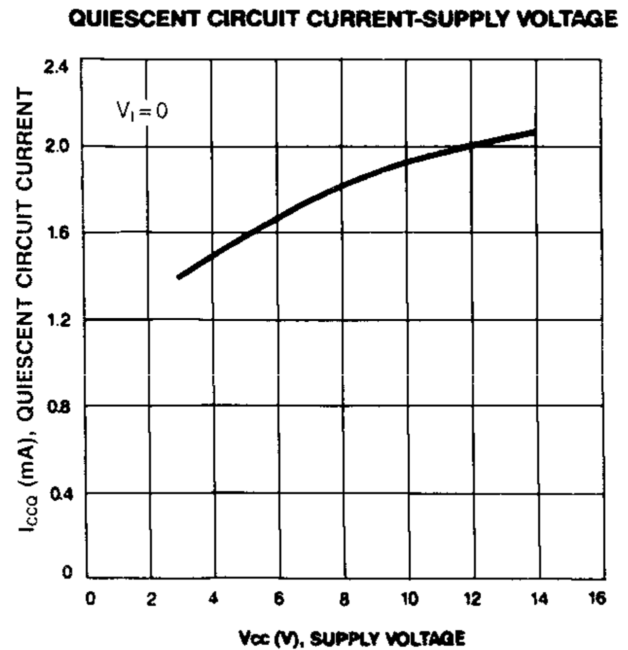

VOLTAGE GAIN-FREQUENCY
Vcc=5V
RL=5.1KΩ
GVO
Cs=30pF
GVC (NAB) 4.75cm/sec
GV (dB), VOLTAGE GAIN
f (Hz), FREQUENCY

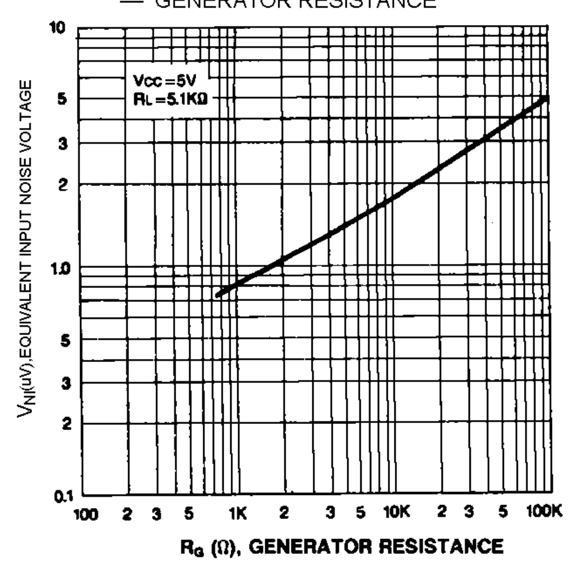

TOTAL HARMONIC DISTORTION-OUTPUT VOLTAGE
Vcc=5V
RL=5.1KΩ
f=100Hz
10KHz
1KHz
THD (%), TOTAL HARMONIC DISTORTION
Vo (V), OUTPUT VOLTAGE


OUTPUT VOLTAGE-INPUT VOLTAGE
Vcc=5V
RL=5.1KΩ
f=100Hz
1KHz
10KHz
Vo (V), OUTPUT VOLTAGE
VI (mW), INPUT VOLTAGE


OUTPUT VOLTAGE-SUPPLY VOLTAGE
RL=5.1KΩ
f=1KHz
THD=1%
Vo (V), OUTPUT VOLTAGE
Vcc (V), SUPPLY VOLTAGE


VOLTAGE GAIN-SUPPLY VOLTAGE
RL=5.1KΩ
f=1KHz
GVO
GV
GV (dB), VOLTAGE GAIN
Vcc (V), SUPPLY VOLTAGE


QUIESCENT CIRCUIT CURRENT-SUPPLY VOLTAGE
VI=0
ICCQ (mA), QUIESCENT CIRCUIT CURRENT
Vcc (V), SUPPLY VOLTAGE



APPLICATION INFORMATION

ACL Grade Binning Table

Symbol	A_V (dB)		ALC Grade (dB)	
	Min	Max	Min	Max
KA2220 J KA2220 M	34	36	– 16.0 – 25.0	– 27.0 – 34.0

External Components (Refer to test circuits)

C_1: Input coupling capacitor
The recommended value is 10μF. If made too small the low frequency characteristics will change for the worse, and too large a capacitance value will increase the risting time when power is applied.

C_2: Bypass capacitor
Short emitter resistor on the AC and prevents an AC signal from feedback to input.

C_3, R_1, R_2: Equalizer network
The closed loop voltage gain is determined by these components in relation to the internal resistance at Pin 3.

C_4: Output coupling capacitor
C_2 is determined as follows:

$$C_4 = \frac{1}{2\pi \cdot f_L \cdot R_L}$$

f_L: low cut-off frequency
R_L: load resistance

C_5: Phase compensation capacitor.
Prevents high frequency oscillation by phase error when feedback is heavy.

C_6: Ripple filter for power supply
A large value is required to get an excellent ripple characteristic under the line operation, but must be made smaller to shorten the starting time.

R_3: Filter resistance.

R_4: Collector resistor of first stage transistor of the IC
Low voltage characteristic can be improved by adjusting this resistance.

ALC GRADE BINNING TEST CIRCUIT

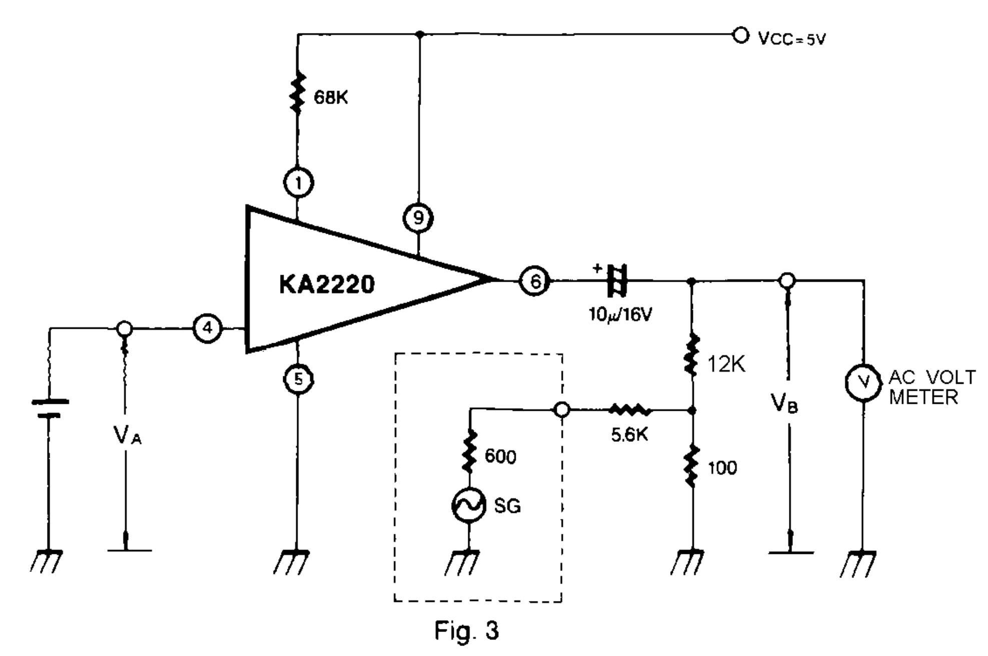


Fig. 3

Test condition: S.G output level should be adjusted to be 13.8mV of the AC voltmeter reading (V_B) when the D.U.T is not connected from the test circuit (V_{CC}=5V, V_A=1.16V, T_a=25°C)
ALC RANK is defined as ALC-G.R=20log V_{B2}/V_{B1}
where
V_{B1}: AC voltmeter reading when the D.U.T is not connected
V_{B2}: AC voltmeter reading when the D.U.T is connected

APPLICATION CIRCUIT

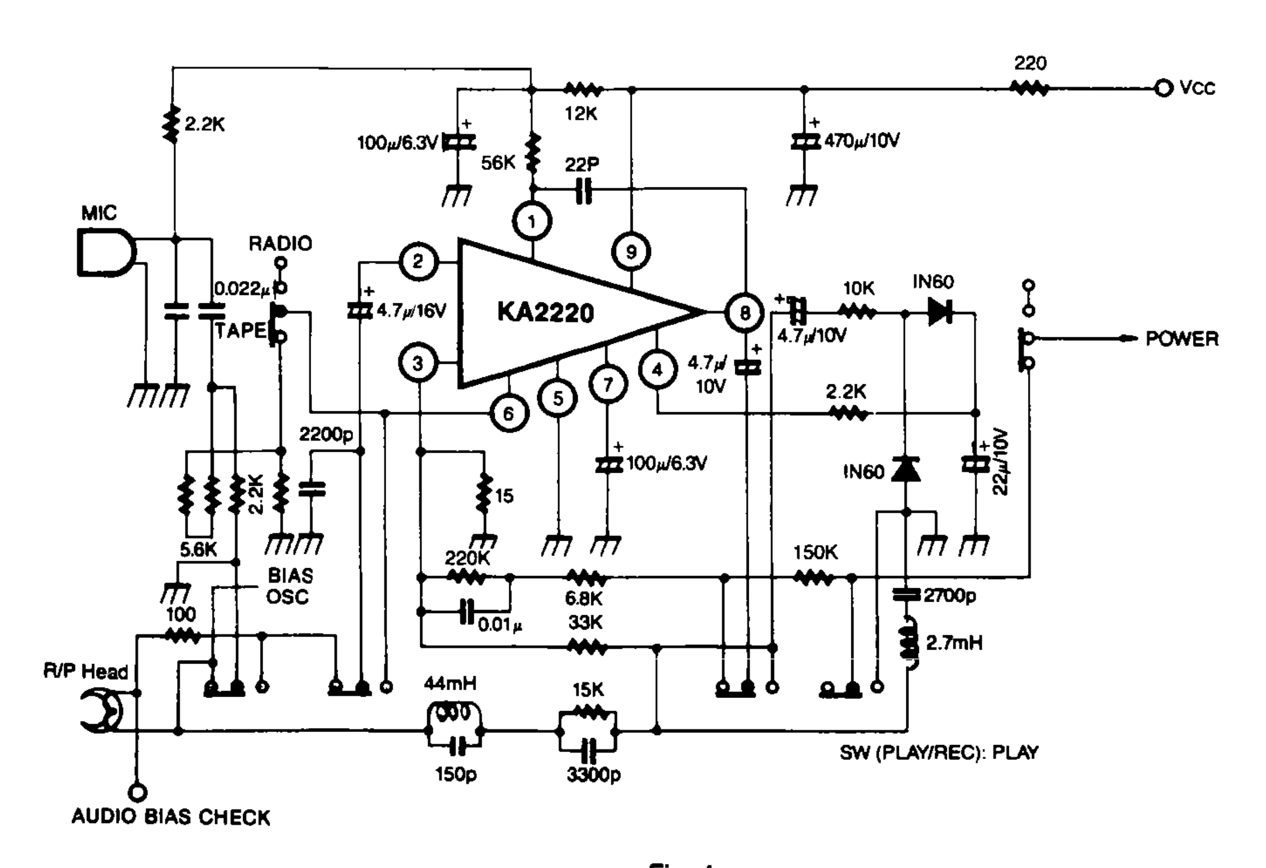


Fig. 4